Econometrics is the application of statistical methods to the quantification and critical assessment of hypothetical economic relationships using data. This course gives students an opportunity to develop an understanding of econometrics to a standard that will equip them to understand and evaluate most applied analysis of cross-sectional data and to be able to undertake such analysis themselves.

Prerequisite
If taken as part of a BSc degree, the following course(s) must be passed before this course may be attempted:
EC1002 Introduction to economics and ST104A Statistics 1 (half course) and (MT105A Mathematics 1 (half course) or MT1174 Calculus or MT1186 Mathematical methods)

Co-requisite
Students can only take this course at the same time as or after ST104B Statistics 2 and MT105B Mathematics 2, not before.

However, students taking MT1174 Calculus or MT1186 Mathematical methods do not need to take MT105B Mathematics 2.

Aims and objectives
The aims of this course are:
- To develop an understanding of the use of regression analysis and related techniques for quantifying economic relationships and testing economic theories.
- To equip students to read and evaluate empirical papers in professional journals.
- To provide students with practical experience of using mainstream regression programmes to fit economic models.

Essential reading
For full details, please refer to the reading list.
- Dougherty, C. Introduction to Econometrics. (Oxford: Oxford University Press)

Assessment
- This course is assessed by a three-hour unseen written examination

Students should consult the appropriate EMFSS Programme Regulations, which are reviewed on an annual basis. The Regulations provide information on the availability of a course, where it can be placed on your programme’s structure, and details of co-requisites and prerequisites.
Learning outcomes
At the end of the course and having completed the essential reading and activities students should be able to:

☑ Describe and apply the classical regression model and its application to cross-section data.
☑ Describe and apply the:
  o Gauss-Markov conditions and other assumptions required in the application of the classical regression model
  o reasons for expecting violations of these assumptions in certain circumstances
  o tests for violations
  o potential remedial measures, including, where appropriate, the use of instrumental variables.
☑ Recognise and apply the advantages of logit, probit and similar models over regression analysis when fitting binary choice models.
☑ Competently use regression, logit and probit analysis to quantify economic relationships using standard regression programmes (Stata and EViews) in simple applications.
☑ Describe and explain the principles underlying the use of maximum likelihood estimation.
☑ Apply regression analysis to fit time-series models using stationary time series, with awareness of some of the econometric problems specific to time series applications (for example, autocorrelation) and remedial measures.
☑ Recognise the difficulties that arise in the application of regression analysis to nonstationary time series, know how to test for unit roots, and know what is meant by cointegration.
Syllabus
This is a description of the material to be examined. On registration, students will receive a detailed subject guide which provides a framework for covering the topics in the syllabus and directions to the essential reading.


Multiple regression analysis: Multiple regression with two explanatory variables. Graphical representation of a relationship in a multiple regression model.


Stochastic regressors and measurement errors: Stochastic regressors. Assumptions for models with stochastic regressors. Finite sample and asymptotic properties of the regression coefficients in models with stochastic regressors. Measurement error and its consequences. Friedman’s Permanent Income Hypothesis. Instrumental variables (IV). Three requirements of an instrument. Asymptotic properties of IV estimators, including the asymptotic limiting distribution of $\sqrt{n}(\beta_2^IV - \beta_2)$ where $\beta_2^IV$ is the IV estimator of $\beta_2$ in a simple regression model. Use of simulation to investigate the finite-sample properties of estimators when only asymptotic properties can be determined analytically. Multiple instruments. Application of the Durbin–Wu–Hausman test.


Models using time series data (continued): Lagged variables and naive attempts to model dynamics. Long run and short run effects. Autoregressive distributed lag (ADL) models with applications in the form of the partial adjustment and adaptive expectations models. Error correction models. Asymptotic properties of OLS estimators of ADL models, including asymptotic limiting distributions. Use of simulation to investigate the finite sample properties of parameter estimators for the ADL(1,0) model. Use of predetermined variables as instruments in simultaneous equations models using time series data.
